Practitioner's Docket No. 35010.099 *PATENT*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Slange
9/11/03

In re application of: Crisfield
Application No.: 09/430,052
Technology Center: 2800 Group No.: 2855
Filed: October 29, 1999 Examiner: Martir, Lilybet
For: A CORIOLIS FLOWMETER HAVING A REDUCED FLAG DIMENSION FOR HANDLING LARGE MASS FLOWS

Box AF
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF FROM APPLICANTS

Pursuant to 37 C.F.R. § 1.192, the Applicants hereby submit this appeal brief. This appeal brief is timely filed within two months from the date of the Notice of Appeal and is accompanied by the proper fee under 37 C.F.R. § 1.17(c). Therefore, the Applicants ask the Board of Patent Appeals and Interferences to consider this appeal brief.

I. Real Party in Interest

The real party in interest for this appeal is Micro Motion, Inc., a Colorado Corporation. The inventors, Matthew T. Crisfield and John Richard McCarthy, assigned their right, title, and interest in this application to Micro Motion, Inc. The Assignment is recorded with the United States Patent and Trademark Office at Reel/Frame 010368/0694.

II. Related Appeals and Interferences

There are no related appeals or interferences for this application.

III. Status of Claims

Claims 1-11 stand rejected. The Examiner rejected claims 1-11 under 35 U.S.C. § 103(a). The Applicants are appealing the rejection of claims 1-11.

IV. Status of Amendments

Claims 1-11 were originally filed. Claims 1-2, 4, 6-7, and 9-11 were amended in response to an Office Action dated July 5, 2001. Claim 1 was amended a second time in response to an Office Action dated June 4, 2002. Claim 1 was amended a third time in response to an Office Action dated October 2, 2002. There were no amendments filed subsequent to the final rejection of April 1, 2003. There are currently no outstanding amendments.

V. Summary of the Invention

The invention relates to a Coriolis flowmeter of compact size, which is also referred to as a flowmeter having reduced flag dimension. One embodiment of the invention comprises a Coriolis flow meter (5) that includes a first flow tube (103A), a second flow tube (103B), a driver (104), a first brace bar (120), a second brace bar (121), and pick-offs (105, 105') (*see pending application*; FIG. 1; page 5, line 13 to page 8, line 10). The first flow tube (103A) has an inlet end (151) and an outlet end (152) (*see pending application*; FIG. 1; page 7, lines 6-8). The first flow tube (103A) has a shape that forms substantially a semicircle that begins at the inlet end (151) and ends at the outlet end (152) (*see pending application*; FIG. 1; page 7, lines 6-8). The second flow tube (103B) has an inlet end (151') and an outlet end (152') (*see pending application*; FIG. 1; page 7, lines 6-8). The second flow tube (103B) has a shape that forms

substantially a semicircle that begins at the inlet end (151') and ends at the outlet end (152') (*see pending application*; FIG. 1; page 7, lines 6-8). The driver (104) is affixed to the first flow tube (103A) at a point on the first flow tube that is substantially perpendicular to a bending axis of the first flow tube (*see pending application*; FIG. 1; page 6, lines 14-22). The driver (104) is also affixed to the second flow tube (103B) at a point on the second flow tube that is substantially perpendicular to a bending axis of the second flow tube (*see pending application*; FIG. 1; page 6, lines 14-22). The driver (104) is configured to oscillate the first flow tube (103A) and the second flow tube (103B) in opposition to each other (*see pending application*; FIG. 1; page 6, lines 14-16).

The first brace bar (120) is affixed to the first flow tube (103A) proximate the inlet end (151) of the first flow tube and is affixed to the second flow tube (103B) proximate the inlet end (151') of the second flow tube (*see pending application*; FIG. 1; page 7, lines 17-19). The second brace bar (121) is affixed to the first flow tube (103A) proximate the outlet end (152) of the first flow tube and is affixed to the second flow tube (103B) proximate the outlet end (152') of the second flow tube (*see pending application*; FIG. 1; page 7, lines 19-21). The pick-offs (105, 105') are affixed to the first flow tube (103A) and the second flow tube (103B) in a position that allows the pick-offs to detect a desired amount of Coriolis force at a low amplitude vibration (*see pending application*; FIG. 1; page 8, lines 3-5).

VI. Issues

Whether claims 1-7, and 10-11 are obvious under 35 U.S.C. § 103(a) over U.S. Patent 5,663,509 (Lew) and U.S. Patent 5,394,758 (Wenger), and whether claims 8-9 are obvious under 35 U.S.C. § 103(a) over Lew, Wenger, and U.S. Patent 5,663,509 (Ollila).

1. Whether Lew and Wenger can be properly combined for the 35 U.S.C. § 103(a) rejection.

2. If combined, whether Lew and Wenger teach all of the limitations in the claims.

VII. Grouping of Claims

For the purpose of this appeal, Group 1 represents claims 1, 2, 4, and 6-8, Group 2 represents claims 3 and 5, Group 3 represents claim 9, and Group 4 represents claims 10-11.

VIII. Argument

This argument is presented according to 37 C.F.R. § 1.192(c)(8)(iv). The Applicants submit that Lew and Wenger cannot be properly combined for this 35 U.S.C. § 103(a) rejection. The Applicants further submit that, even if combined, Lew and Wenger do not teach all the limitations of the claims.

A. Summary of Prior Art References

To help clarify the Applicant's argument, the following briefly summarizes the Examiner's characterization of Lew and Wenger.

In Lew, the Examiner cites to the example illustrated in FIG. 5. FIG. 5 in Lew illustrates an inertia force flowmeter that comprises conduits 44, 45, a vibrator 48, a vibratory motion sensor 49, and a pair of differential pressure sensors 50, 51 (*see Lew*; FIG. 5; column 11, lines 6-55). The vibrator 48 vibrates the conduits 44, 45 in opposite directions at the center of the conduits 44, 45 (*see Lew*; FIG. 5; column 11, lines 13-16). The vibratory motion sensor 49 measures the motion of the conduits 44, 45 at a center plane of the conduits and generates a signal representing the motion (*see Lew*; FIG. 5; column 11, lines 21-24). The pressure sensors 50, 51 are located symmetric about the center plane of the conduits 44, 45 (*see Lew*; FIG. 5; column 11, lines 26-27). Each pressure sensor 50, 51 measures the difference between two fluid pressures in the conduits 44, 45 (*see Lew*; FIG. 5; column 11, lines 27-34). Lew asserts that a mass flow rate can be determined from the above measurements (*see Lew*; column 8, lines 10-43).

FIG. A of this appeal brief reproduces the shape of the conduits 44, 45 in Lew. The conduits 44, 45 in FIG. A correspond to the conduits 44, 45 in FIG. 5 of Lew. The shape of the conduits 44, 45 in FIG. A is described from left to right. Note that the reference numbers in the 100's in FIG. A are added for this explanation and are not shown in FIG. 5 in Lew.

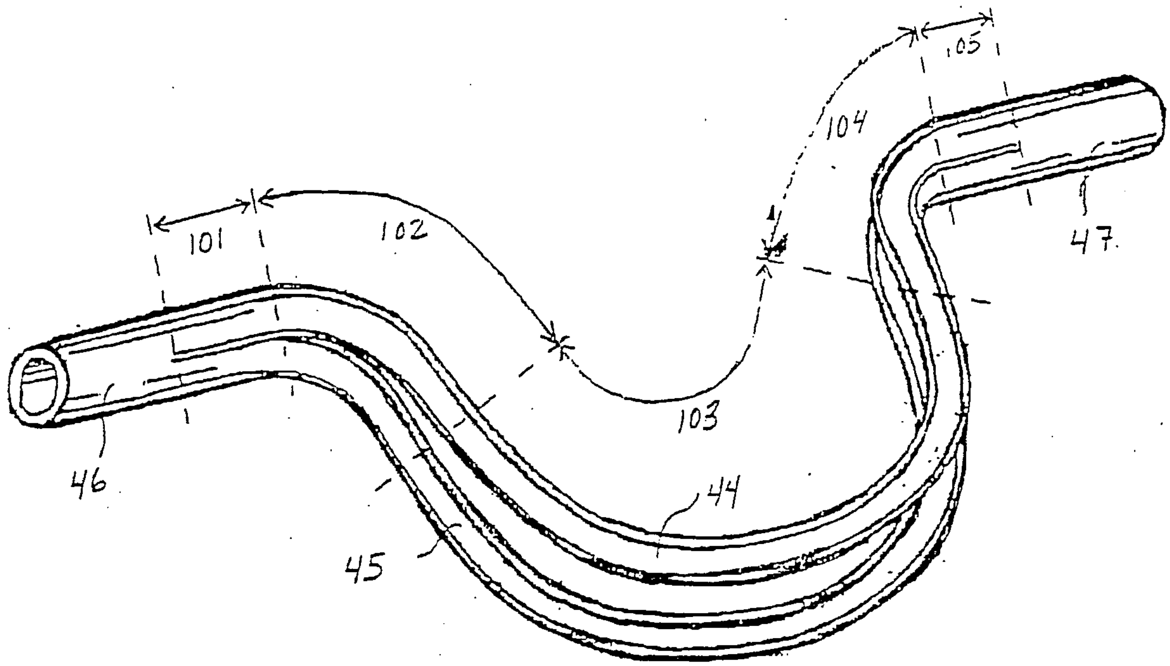

FIG. A

In FIG. A, each conduit 44, 45 includes a straight portion 101, a bending portion 102, a curved portion 103, a bending portion 104, and a straight portion 105. A common inlet leg 46 connects to straight portions 101 of each conduit 44, 45. A common outlet leg 47 connects to straight portions 105 of each conduit 44, 45.

Wenger recites a Coriolis flowmeter comprised of flanges 19, 20, flow tubes 11, 12, plates 15, 32, 33, a vibration exciter 16, sensors 17, 18, and evaluation electronics (*see Wenger*; FIGS. 1-2; column 3, line 58 to column 5, line 17). Flow tube 11 is comprised of a straight inlet portion 111, a tube bend 115, and a straight outlet portion 112 (*see Wenger*; FIG. 1-2; column 4, lines 13-21). Flow tube 12 is comprised of a straight inlet portion 121, a tube bend 125, and a straight outlet portion 122 (*see Wenger*; FIG. 1-2; column 4, lines 13-21). Plate 15 is attached to the flow tubes 11, 12 where the inlet portions 111, 121 and the outlet portions 112, 122 meet the tube bends 115, 125 (*see Wenger*; FIGS. 1-2; column 4, lines 13-21). Plate 32 is connected to inlet portions 111, 121. Plate 33 is connected to outlet portions 112, 122. In operation, the vibration exciter 16 vibrates the flow tubes 11, 12 and the sensors 17, 18 measure vibrations in flow tubes 11, 12 (*see Wenger*; column 4, line 45 to column 5, line 5). Wenger states that the

evaluation electronics process the vibrations of the flow tubes 11, 12 to determine a mass flow rate (*see Wenger*; column 5, lines 10-14).

B. Whether Lew and Wenger can be Properly Combined for the § 103 Rejection

The Applicants submit that Lew and Wenger cannot be properly combined for this 35 U.S.C. § 103(a) rejection. The United States Patent and Trademark Office has the burden to produce factual evidence indicating that the claimed invention is *prima facie* obvious. *In re Peehs*, 612 F.2d 1287, 204 UPSQ 835 (CCPA 1980). To establish *prima facie* obviousness under § 103, there must be some suggestion or motivation to combine the reference teachings. *Ex parte Levengood*, 28 USPQ2d 1300, 1301 (Bd. Pat. App. & Int 1993); *In re Geiger*, 815 F.2d 686, 688 (Fed. Cir. 1987); MPEP § 706.02(j). The Examiner must present evidence that one skilled in the art would have been led to combine the prior art references. *Id.* The evidence is preferably some teaching, suggestion, or inference in the prior art, or general knowledge in the art. *Id.* The Examiner failed to show evidence of a suggestion or motivation to combine Lew and Wenger, and thus has not met the burden of *prima facie* obviousness.

Specifically, the Examiner failed to show any suggestion or motivation to combine Lew and Wenger to teach the Coriolis flowmeter of claim 1. Lew teaches an inertia force flowmeter and Wenger teaches a Coriolis flowmeter. The Examiner failed to show *what* would motivate one skilled in the art to combine an inertia force flowmeter with a Coriolis flowmeter. The Examiner failed to show *why* one skilled in the art would be motivated to combine the inertia force flowmeter in Lew with the Coriolis flowmeter in Wenger to produce the Coriolis flowmeter of claim 1. The Examiner also failed to show *how* one skilled in the art would combine the inertia force flowmeter in Lew with the Coriolis flowmeter in Wenger to produce the Coriolis flowmeter of claim 1.

Lew actually teaches away from Coriolis flowmeters by suggesting that Coriolis flowmeters are inferior to inertia force flowmeters. Lew states that Coriolis flowmeters operate on principles that are not rigorous or accurate, that Coriolis flowmeters lack self-calibrating ability and need to be recalibrated, and that Coriolis flowmeters are vulnerable to ambient vibrations and have problems measuring low-density materials (*see Lew*; column 1, lines 50-63). Lew further states that the problems with Coriolis flowmeters stem from the fact that Coriolis flowmeters measure vibration of a conduit at two points, and determine a mass flow rate based

on a phase difference between the vibrations at the two points (*see Lew*; column 1, line 63 to column 2, line 2). Lew further states that "it is greatly more advantageous to measure the two transverse pressure gradients respectively existing at the two different sections of the conduit rather than measuring the flexural vibration of the conduit at the two different sections of the conduit, and determine the mass flow rate of fluid as a function of the phase difference between the two transverse pressure gradients instead of the phase difference between the two flexural vibrations." (*see Lew*, column 2, lines 8-15). Lew further states that the inertia force flowmeter measures the convective inertia force directly *instead* of measuring an effect of the convective inertia force in the form of the resulting flexible *vibration* of the conduit (*see Lew*; column 2, lines 23-31). Lew further states that "[U]nlike the conventional method of operating the existing versions of the Coriolis force flowmeter, wherein the conduit must be flexurally vibrated at one of its natural frequencies of the flexural vibration thereof, the conduit employed in the inertia force flowmeter of the present invention can be transversely reciprocated or flexurally vibrated at *any* desired frequencies, which may or may not be a natural frequency of the combined structure of the conduit 1 and the reinforcing structure 8" (*emphasis added*)(*see Lew*; column 8, lines 44-52).

Lew asserts that his inertia force flowmeter is superior to a Coriolis flowmeter. Thus, not only is there no teaching, suggestion, or motivation to combine Wenger with Lew, but modifying the inertia force flowmeter in Lew to produce the Coriolis flowmeter of claim 1 would be a disadvantage.

Because Lew teaches away from Coriolis flowmeters, the Applicants submit that the Examiner used hindsight after reading the claimed invention to combine Lew and Wenger. The Examiner cannot use the claimed invention as a template or blue print to piece together isolated references when making an obviousness rejection. *Sensonics Inc. v. Aerosonic Corp.*, 38 USPQ2d 1551, 1554 (CA FC 1996); *Ex parte Haymond*, 41 USPQ2d 1217, 1220 (Bd Pat App & Int 1996). The Examiner must consider the state of the art at the time of the invention and not use hindsight knowledge after reading the invention. *Sensonics Inc. v. Aerosonic Corp.*, 38 USPQ2d at 1554.

C. References Do Not Teach All Limitations of the Claims

Even if, arguendo, Lew and Wenger can be properly combined, the Applicants submit

that Lew and Wenger do not teach all of the limitations of the claims as required under 35 U.S.C. § 103(a). To establish *prima facie* obviousness under § 103, the prior art references must teach or suggest all the claim limitations. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1980); MPEP § 706.02(j). The Examiner failed to show evidence that Lew and Wenger teach all the limitations of the claims, and thus has not met the burden of *prima facie* obviousness.

1. Independent Claim 1 (Group 1)

The Applicants submit that neither Lew nor Wenger teach the following limitations of claim 1:

1. "a first flow tube having an inlet end and an outlet end, said first flow tube *forming substantially a semicircle* that begins at said inlet end of said first flow tube and ends at said outlet end of said first flow tube",

2. "a second flow tube having an inlet end and an outlet end, said second flow tube *forming substantially a semicircle* that begins at said inlet end of said second flow tube and ends at said outlet end of said second flow tube",

3. "a first brace bar affixed to said first flow tube proximate said inlet end of said first flow tube and affixed to said second flow tube proximate said inlet end of said second flow tube", and

4. "a second brace bar affixed to said first flow tube proximate said outlet end of said first flow tube and affixed to said second flow tube proximate said outlet end of said second flow tube".

The Examiner failed to produce a reference that teaches a Coriolis flowmeter with a flow tube *forming substantially a semicircle* that begins at an inlet end of the flow tube and ends at the outlet end of the flow tube as in limitations 1 and 2 above. The Examiner maintains that Lew teaches a flow tube that forms substantially a semicircle because the conduits 44, 45 in Lew are "largely but not wholly" semicircular (*see April 1, 2003 Office Action*; pages 2 and 7).

The Applicants submit that Lew does not teach the flow tubes claimed in claim 1, as the conduits 44, 45 in Lew are not semicircular. In Lew, each conduit 44, 45 includes two straight portions 101, 105 and two bending portions 102, 104 joined by a curved portion 103 (*see herein,* FIG. A). A conduit having a curved portion 103, two straight portions 101, 105, and two bending portions 102, 104, as the conduits in FIG. 5 in Lew, *cannot* form a semicircle. The question thus becomes whether a conduit having a curved portion 103, two straight portions 101, 105, and two bending portions 102, 104 can be considered to form ***substantially*** a semicircle.

The term "substantially" may be properly used in claims and does not necessarily render a claim indefinite. *See Ecolab Inc. v. Envirochem, Inc.,* 264 F.3d 1358, 1367, 60 USPQ2d 1173, 1179 (CA FC 2001); *Andrew Corp. v. Gabriel Elecs. Inc.*, 847 F.2d 819, 821-22, 6 USPQ2d 2010, 2013 (Fed. Cir. 1988). "Substantially" can be used in claims "in order to accommodate the minor variations that may be appropriate to secure the invention". *Verve LLC v. Crane Cams Inc.,* 65 USPQ2d 1051, 1054 (CA FC 2002). For instance, in *Ecolab Inc. v. Envirochem, Inc.*, the term "substantially uniform" was used in a claim. The Court of Appeals stated that the term "substantially" was properly used in the claim to avoid a strict 100% nonuniformity boundary. *Ecolab Inc. v. Envirochem, Inc.,* 60 USPQ2d at 1179.

Thus, the term "substantially" is properly used in claim 1 of the pending application. Using the term "substantially" avoids strict adherence to the flow tubes forming "a semicircle that begins at said inlet end … and ends at said outlet end". The term "substantially" allows the flow tubes of claim 1 to have a shape with *minor variations* from a semicircle from inlet end to outlet end. *See Verve LLC v. Crane Cams Inc.*, 65 USPQ 2d at 1054. In contrast, the conduits 44, 45 in Lew have straight portions 101, 105 and bending portions 102, 104, in addition to the curved portion 103 (*see herein*, FIG. A). Thus, the shape of the conduits 44, 45 in Lew represents much more than a minor variation from a semicircle (*see herein*, FIG. A).

The Applicants further submit that Wenger does not teach the flow tubes claimed in claim 1, as the flow tubes 11, 12 in Wenger are not semicircular. Wenger teaches U-shaped flow tubes (*see Wenger*; FIGS 1-2). The Examiner has not suggested that the U-shaped flow tubes in Wenger teach the flow tubes of claim 1.

With regard to limitations 3 and 4 of claim 1 above, the Examiner failed to show where Lew and Wenger teach brace bars. Lew does not teach brace bars as in claim 1. Even though Wenger does recite brace bars 32, 33, the Examiner failed to show a suggestion or motivation to

affix brace bars to the conduits 44, 45 in Lew. Brace bars connected to the conduits 44, 45 in Lew would not help the performance of the inertia force flowmeter in FIG. 5, as the inertia force flowmeter in FIG. 5 is measuring pressure with pressure sensors 12, 13. The Examiner improperly used hindsight after reading the invention to combine the brace bars 32, 33 in Wenger with the conduits 44, 45 of Lew.

The above arguments apply equally to claims 2, 4, and 6-8.

2. Dependent Claims 3 and 5 (Group 2)

The Applicants submit that neither Lew nor Wenger teach all of the limitations of claims 3 and 5 as required under 35 U.S.C. § 103. For claims 3 and 5, the Examiner failed to show where either Lew or Wenger teaches a manifold having a substantially 90 degree bend in a flow path. The Examiner states that Lew teaches a substantially 90 degree bend between conduits 44, 45 and inlet manifold 46 (*see Lew*; FIG. 5). However, inlet manifold 46 in FIG. 5 in Lew is straight and does not have any bending portions. The bending portions are in conduits 44, 45. One advantage of an embodiment of claims 3 and 5 of the pending application is that the manifolds can be cast separately from each other and the flow tubes (*see application*; page 4). This can reduce the cost of material, among other advantages.

3. Dependent Claim 9 (Group 3)

The Applicants submit that neither Lew nor Wenger teach all of the limitations of claim 9 as required under 35 U.S.C. § 103. For claim 9, the Examiner failed to show where Lew, Wenger, or Ollila teaches a casing having a mass affixed to change the vibration modes of the housing. Ollila recites a housing base 450 and a housing cover 701 that surround the flow tubes of a flowmeter (*see Ollila*; FIGS 4 and 7). However, Ollila does not teach a mass affixed to housing base 450 and housing cover 701 to change the vibration modes as the casing in claim 9.

4. Dependent Claims 10-11 (Group 4)

The Applicants submit that neither Lew nor Wenger teach all of the limitations of claims 10 and 11 as required under 35 U.S.C. § 103. For claims 10-11, neither Lew nor Wenger teach where to position the pick-offs on the flow tubes. Lew recites affixing differential pressure sensors 50, 51 on a bending axis of conduits 44, 45 in FIG. 5, but does not teach where to

position a pick-off to measure Coriolis forces. Wenger recites affixing sensors 17, 18 to flow tubes 11, 12, but does not teach where to position the sensors 17, 18. Wenger positions the sensors 17, 18 on the straight portions of the flow tubes 11, 12 and not on a bending portion (*see Wenger*, FIGS. 1-2). Therefore, Wenger does not teach positioning the pick-offs 25-50 degrees from a bending axis (claim 10) or 30 degrees from a bending axis (claim 11). Positioning the pick-offs according to claims 10-11 advantageously allows lower amplitude vibration to be used in the flowmeter to reduce the stress on the brace bars.

D. Conclusion

Based on the above arguments, the Applicants submit that claims 1-11 are allowable over Lew and Wenger.

Respectfully submitted,

Date: 8-29-03

SIGNATURE OF PRACTITIONER

Brett L. Bornsen, Reg. No. 46,566
Duft Setter Ollila & Bornsen LLC
Telephone: (303) 938-9999 ext. 17
Facsimile: (303) 938-9995

Correspondence address: CUSTOMER NO. 32827

Priority 10/29/99

IX. Appendix

A copy of the claims involved in the appeal follow.

1. A Coriolis flowmeter having a reduced flag dimension comprising:

a first flow tube having an inlet end and an outlet end, said first flow tube forming substantially a semicircle that begins at said inlet end of said first flow tube and ends at said outlet end of said first flow tube;

a second flow tube having an inlet end and an outlet end, said second flow tube forming substantially a semicircle that begins at said inlet end of said second flow tube and ends at said outlet end of said second flow tube;

a driver affixed to said first flow tube at a point on said first flow tube that is substantially perpendicular to a bending axis of said first flow tube, said driver also affixed to said second flow tube at a point on said second flow tube that is substantially perpendicular to a bending axis of said second flow tube, wherein said driver oscillates said first flow tube and said second flow tube in opposition to each other;

a first brace bar affixed to said first flow tube proximate said inlet end of said first flow tube and affixed to said second flow tube proximate said inlet end of said second flow tube;

a second brace bar affixed to said first flow tube proximate said outlet end of said first flow tube and affixed to said second flow tube proximate said outlet end of said second flow tube; and

pick-offs affixed to said first flow tube and said second flow tube in a position that allows said pick-offs to detect a desired amount of Coriolis force at a low amplitude vibration.

2. The Coriolis flowmeter of claim 1 further comprising:

an inlet manifold affixed to said inlet end of said first flow tube and said inlet end of said second flow tube to affix said first flow tube and said second flow tube to a pipeline.

3. The Coriolis flowmeter of claim 2 further comprising:

a substantially 90 degree bend in a flow path through said inlet manifold.

4. The Coriolis flowmeter of claim 1 further comprising:

an outlet manifold affixed to said outlet end of said first flow tube and said outlet end of said second flow tube to connect said first flow tube and said second flow tube to a pipeline.

5. The Coriolis flowmeter of claim 4 further comprising:

a substantially 90 degree bend in a flow path though said outlet manifold.

6. The Coriolis flowmeter of claim 1 further comprising:

an inlet manifold affixed to said inlet end of said first flow tube and said inlet end of said second flow tube to affix said first flow tube and said second flow tube to a pipeline;

an outlet manifold affixed to said outlet end of said first flow tube and said outlet end of said second flow tube to connect said first flow tube and said second flow tube to said pipeline; and

a spacer affixed to said inlet manifold and said outlet manifold to maintain a fixed distance between said inlet manifold and said outlet manifold.

7. The Coriolis flowmeter of claim 6 wherein said spacer comprises:

an inlet end affixed to said inlet manifold;

an outlet end affixed to said outlet manifold;

a top side, a bottom side, a front side, and a back side each extending between said inlet end of said spacer and said outlet end of said spacer to form a rectangular body; and

openings through said top side of said spacer through which said first flow tube and said second flow tube are affixed to said inlet manifold and said outlet manifold.

8. The Coriolis flowmeter of claim 7 further comprising:

a casing that encloses said first flow tube and said second flow tube affixed to said top side of said spacer.

9. The Coriolis flowmeter of claim 8 wherein said casing comprises:

a front side wall;

a back side wall; and

a mass affixed to said front side wall and said back side wall to change vibrational modes of said casing.

10. The Coriolis flowmeter of claim 1 wherein said position of said pick-offs is substantially 25-50 degrees from said bending axis of said first flow tube and said bending axis of said second flow tube.

11. The Coriolis flowmeter of claim 10 wherein said position of said pick-offs is 30 degrees from said bending axis of said first flow tube and said bending axis of said second flow tube.